September 1991

BEST PRACTICE PROGRAMME

Energy Consumption Guide 16

SAVING ENERGY IN SCHOOLS

THE 'SCHOOL ENERGY MANAGER'S' GUIDE TO ENERGY EFFICIENCY

This Guide is designed to help you understand the factors that influence the size of your school's energy bills. It describes the importance of regular monitoring of fuel consumption and outlines the first steps you can take to cut out the wasteful use of energy.

Newly created "School Energy Managers" may feel powerless to make any significant savings because of the poor state of the school buildings or boilers. But the worse things are, the easier it may be to find ways to improve on them. Savings of 10-15% are readily achievable in most schools and it is not unknown for a conscientious teacher or governor, acting as energy manager, to reduce a school's energy bill still further.

Whatever your starting point, improvement is always possible.

Whether the person appointed to be responsible for energy is a school secretary, bursar, governor, teacher or caretaker, the general activities are the same ie to:

- Motivate staff and pupils to adopt good housekeeping — shutting windows and doors, switching off unnecessary lights, turning off taps etc.
- Ensure that the heating system is running at optimum efficiency and there is a regular programme of checking thermostats and time clock settings, boiler maintenance etc.
- Identify where investment can achieve worthwhile energy savings, eg. more energy efficient light fittings, better controls for the heating system, etc.

Some of these activities may be delegated to other members of staff. The more people who get involved, the greater the chance of success, especially when everyone has a clear area of responsibility.

The key activities of a School Energy Manager

Monitor fuel consumption

Establish typical weekly consumption for electricity, other fuels (and also water). Don't just rely on energy bills (they could contain an estimate). Reading the meters on a regular basis will help you to spot any abnormalities quickly. Check that fuel bills and tariffs are correct before authorising payment.

Cut out energy waste

Good housekeeping should be the first thing to be introduced to minimise waste. Aim to improve energy awareness in the school, eg each class to nominate pupils to act as Energy Monitors, hold poster competitions, integrate energy matters into the curriculum and project work. Report on progress and publicise how savings are benefitting the school.

Liaise with caretaking staff and Energy Specialists

The support and goodwill of the caretaking staff is crucial if the school is to achieve its optimum energy performance. Many Local Authorities have an Energy Management Unit that can offer specialist advice. Keep in regular contact and invite them to your school to discuss your plans. Your local Regional Energy Efficiency Officer (REEO) will be able to put you in touch with local consulants.

BEST PRACTICE PROGRAMME

Energy Efficiency Office
DEPARTMENT OF ENERGY

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SCHOOL ENERGY MANAGERS

Getting Started

Energy Consumption Guide 15, for headteachers and governors, contains charts to allow a quick comparison of how your school compares with 3,000 other schools surveyed. The job of the School Energy Manager is to look behind those figures, analyse where energy is being used and try to identify fruitful areas where energy costs might be reduced.

Check how much the school spends on each fuel and consider what the fuel is used for. Diagram 1 illustrates this. In most cases, in order to establish the breakdown of use within each fuel, it will be necesary to take regular meter readings and analyse the seasonal variations in consumption. Diagram 2 shows how charting the monthly fuel consumption can be used to identify trends in energy use, and what these trends might reveal.

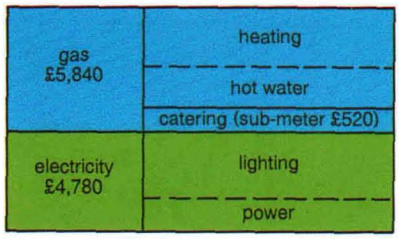
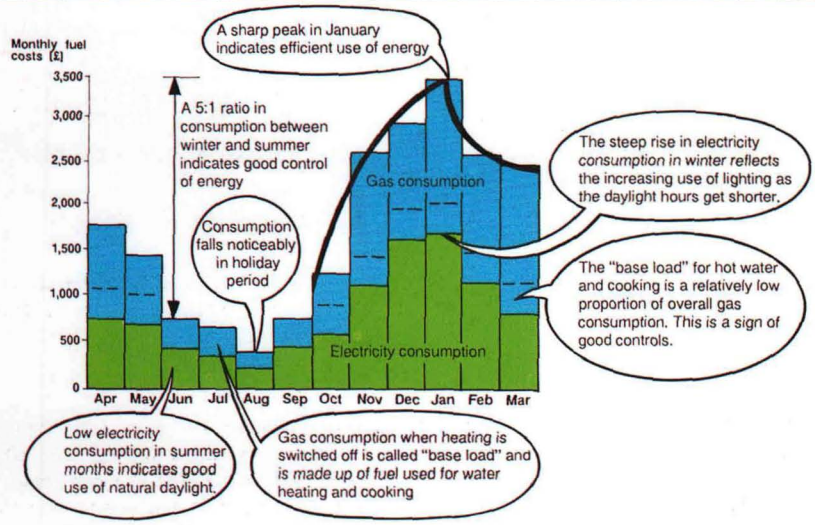


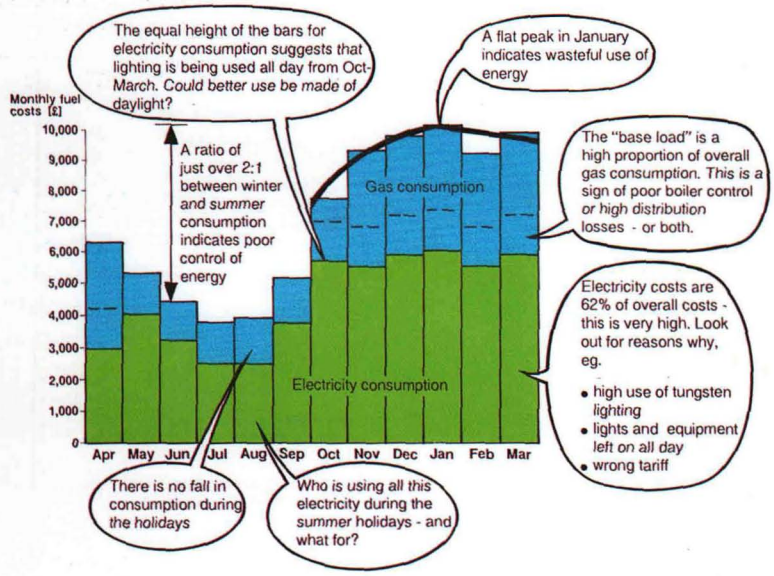
Diagram 1. The first step in analysing fuel use.

Notes

After working out the annual cost of each fuel, establish what it is used for. In the example gas is used for heating, hot water and catering. Electricity is used for lighting and power. For most schools it will not be possible to establish from the fuel bills the breakdown of use within each fuel. Only where there are separate meters serving different parts of the school (eg to the kitchens) will this be immediately obvious.



A school with lower than average energy costs (£22/pupil)



A school with higher than average energy costs (£78/pupil)

Notes

The two graphs show the monitored monthly energy costs of two comprehensive schools. The upper graph is for a school with low energy costs. The lower graph is for a school with high energy costs.

The comments in the "bubbles" illustrate how regular monitoring can be diagnosed to indicate how efficiently energy is being used and to provide an insight into areas where energy might be saved. The following features can be observed:

- The 'shape' of the two graphs is different. The 'good' school has a large 5:1 ratio between winter and summer consumption. In the 'poor' school, the ratio is nearer 2:1. A high ratio is a sign that energy use is well controlled and well managed.
- The size of the "base load". Where boilers are used to provide both heating and hot water, the amount of energy used in summer to supply hot water and keep the boilers 'ticking over' is called the base load. The size of the base load is a good indicator of the efficiency of the heating system — the smaller it is the better. The base load is normally determined from readings in the summer, when the heating is not in use, but the boiler(s) are providing hot water. The dotted lines in the graphs indicate the size of the base load, which was established from the gas consumption in June. The gas consumption 'above' the base load can be assumed to be for heating. In the 'good' school, 68% of annual gas consumption is for heating. In the 'poor' school this drops to only 50%.

Working out how electricity is used from the monitored consumption figures is less easy. The increased use of electricity during the winter months will largely be due to greater use of the lighting system as daylight hours get shorter. The use of pumps and other plant associated with the heating system also increase winter electricity consumption.

To obtain a more accurate picture in the use of electricity, the monitored results need to be supplemented by an energy survey. In some schools this is done by pupils as part of their project work in General Science. By collating information on the following it becomes possible to build up a clearer picture:

- the number, type and wattage of light bulbs
- the number of hours that the lighting is switched on
- rating of computers, photocopiers, pottery kilns, and other electrical equipment and recording their hours of use.

Diagram 2. The monthly energy records of two comprehensive schools

Monitoring

Measuring energy consumption by taking meter readings is an essential part of managing energy costs. Regular monitoring can be useful to:

- check fuel bills are correct when authorising payment
- measure changes in consumption due to the introduction of new plant and equipment or energy awareness campaigns
- establish typical weekly consumptions of electricity, gas, coal, water etc so you can spot abnormal consumption
- check if spending is consistent with budget allocation.

The first step is to find the meters and establish the purpose of each one. Remember that caution may need to be exercised, for example, when meters are 'housed' in areas that are unsuitable for pupils to enter. There may be several electricity meters for different tariffs, 'head' meters (used for payment) and sub-meters (to check how much fuel is used in a part of the school). For example, many school kitchens have a sub-meter to enable fuel for catering to be costed separately. Check that meter reference numbers correspond with those on the fuel bills. Start a regular meter reading programme and consider organising a supervised rota of school pupils to help.

Factors that influence energy costs

The factors that affect the energy costs in your school include:

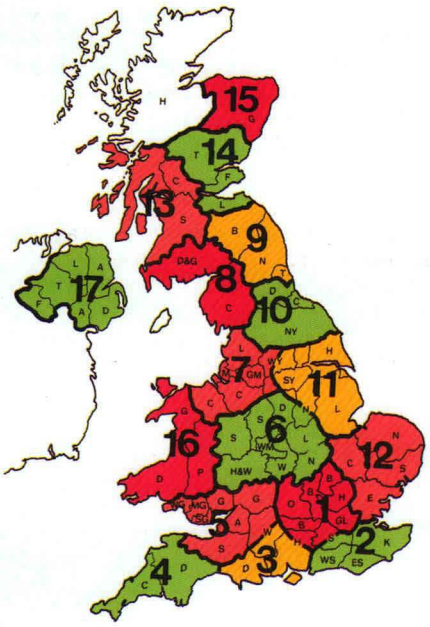
- winter temperatures
- fuel prices
- hours of use
- good housekeeping by staff and pupils
- the school buildings.

Winter temperatures and fuel prices change from year to year. To enable a direct comparison of one year's energy performance with another, it is therefore necessary to make adjustments to compensate for these changes. These are explained below.

Table of Degree Days

Region	1989/90	1990/91	20 year average
1 Thames Valley	1624	1979	2115
2 South Eastern	1989	2238	2407
3 Southern	1904	2279	2296
4 South Western	1477	1930	1947
5 Severn Valley	1563	1862	2078
6 Midlands	2067	2435	2523
7 West Pennines	2049	2344	2369
8 Northern Western	2229	2452	2543
9 Borders	2247	2510	2690
10 North Eastern	2097	2376	2548
11 East Pennines	2066	2329	2446
12 East Anglia	1969	2326	2419
13 West Scotland	2410	2587	2645
14 East Scotland	2381	2654	2726
15 N E Scotland	2482	2713	2873
16 Wales	1974	2222	2304
17 Northern Ireland	2255	2435	2519

Degree Days are an aggregate of the number of °C that the average daily temperature is below 15.5°C for each day of the year. The Meteorological Office produced monthly Degree Day figures for each of the 17 regions in the Table.



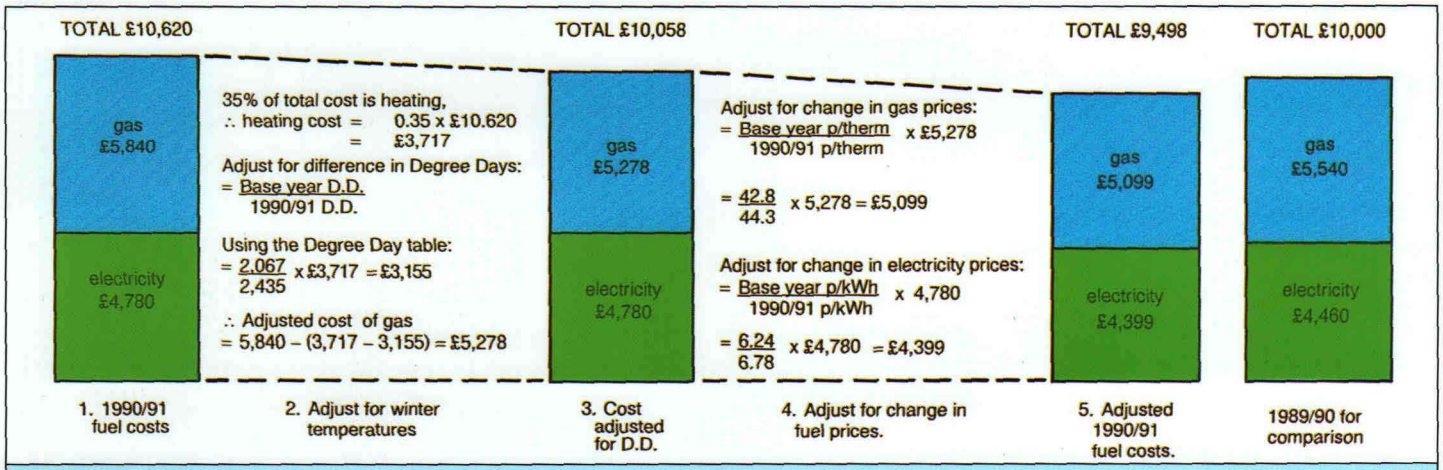
Winter temperatures

The recognised way of comparing one year's temperature with another is to use "Degree Days" (see Table). The fluctuations in energy used for heating during a period correlate closely with the Degree Days for that period. A booklet on Degree Days is available from the EEO.

Diagram 3 shows how Degree Days are used to adjust for differences in external temperatures between one year and another.

Fuel prices

Diagram 3 shows how to make adjustments for changes in fuel prices. The prices used should be the average paid in the relevant year. Alternatively, it is a simple matter to compare consumption in terms of kWh, therms, litres etc. This avoids the distortion of fuel price movements, but an adjustment must still be made for winter temperatures to enable a direct year-on-year comparison to be made.



Notes

1. A school in the Midlands has fuel costs of £10,620 for the 1990/91 financial year. How does this compare with fuel costs of £10,000 for 1989/90, the "base year"?

   It is necessary to take two factors into account to enable a direct comparison between the two years:
   - differences in winter temperature;
   - changes in fuel costs.
2. To adjust for winter temperatures, first establish how much of the total cost is heating. In the absence of accurate figures, assume 35% of total fuel costs. The diagram above shows the calculation, using the Degree Day Table.
3. As 1990/91 was a colder winter than 1989/90, costs have come down.
4. Adjust for changes in fuel prices. Individual adjustments must be made for each fuel, based on average prices per kWh, therm etc. during each of the two years.
5. After adjustment to the 1989/90 winter temperatures and fuel prices, the £10,620 fuel price becomes £9,498, a 5% improvement over the previous year.

Diagram 3. Comparing year-on-year energy costs (a worked example)

SCHOOL ENERGY MANAGERS

Hours of use

The effect of extending the hours of use of a school can be seen in Diagram 4. The normal hours of use of your school are not likely to vary much from one year to the next. However, with LMS, more schools are hiring out their buildings. Get to know the school's average weekly energy cost. You can then use a chart to estimate the amount to charge to cover the cost of heating and lighting during the extra hours of use.

Where the heating system is zoned, provide out of hours heating only to the areas being used, not to the whole school.

Good housekeeping

The adoption by staff and pupils of simple good housekeeping practices, such as keeping windows and doors closed during the heating season and turning off lights when daylighting is adequate, can reduce energy costs by 10% or more. Good practice in the maintenance and operation of the heating system and other services are equally important. *Good Practice Guide 29* describes a whole range of good housekeeping practices for schools.

School buildings

Contrary to popular belief, the age of the school building has only a small influence on the energy costs of a school — there are good and poor energy performers for all groups. Of greater influence is the energy efficiency of the heating system, light fittings and other plant and energy consuming equipment, how they are used ie good housekeeping and the standard of thermal insulation of the school buildings.

The energy efficiency of the school will largely reflect the level of investment in modern plant, equipment and insulation over the years.

Under LMS most schools remain dependent on their Education Authority for capital investment. However, you can help to press for further investment by working with your Local Authority to identify investment opportunities that meet their financial criteria.

The better the monitoring of energy use, the greater the certainty in evaluating the cost-effectiveness of investment proposals.

Useful Organisations and Publications

The Energy Efficiency Office of the Department of Energy has a range of free publications aimed at supporting both energy education and energy management in schools. The EEO published the booklet 'How to bring down energy costs in SCHOOLS' which was issued to schools in November 1990. The booklet includes a list of the EEO regional offices where information on all aspects of energy efficiency can be obtained. The EEO also supply Fuel efficiency booklets, and copies of Energy Management — a bi-monthly publication free to all Energy Managers. For further information contact: Department of Energy, Energy Efficiency Office, Publications, Blackhorse Road, SE99 6TT.

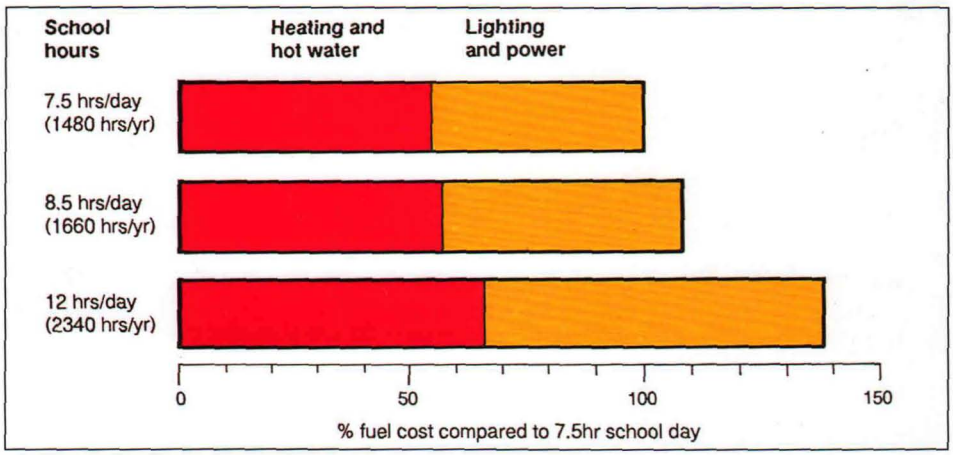


Diagram 4. The effect of extended hours of use on fuel costs

The Building Research Energy Conservation Support Unit (BRECSU), at the Building Research Establishment, manages the EEO Best Practice programme for improving energy efficiency in buildings. BRECSU is currently collaborating with the DES to prepare guidance material on energy efficiency in schools, such as this Guide. Others in the series include:

Information Leaflets

Energy Efficiency in Schools and Colleges: Experience in 20 case studies IL 22

Saving Energy in Schools (already issued to all schools). IL 23

Good Practice Guides:

Good Housekeeping in Schools — A Guide for School Staff, Governors and Pupils. GPG29

Managing Energy in Schools — A Guide for Headteachers and Governors. GPG39

Energy Consumption Guides:

Saving Energy in Schools — The Headteacher's and Governor's Guide to energy efficiency. ECON 15

Saving Energy in Schools — The Local Authority Chief Officer's Guide to energy efficiency. ECON 17

If you would like a current list of BRECSU's EEO Best Practice publications, please contact: Enquiries Bureau, Building Research Energy Conservation Support Unit (BRECSU), Garston, Watford, WD2 7JR.

Tel 0923 664258 or Fax 0923 664097.

The Department of Education and Science (DES) also produces a useful range of free publications. Broadsheets 25 and 27 have particular relevance to energy efficiency. Contact the Publications Despatch Centre 081 952 2366.

The Centre for Research, Education and Training in Energy (CREATE) exists to promote the development of energy education and training. Contact 0492 534896 for further details.

Further copies of this leaflet can be obtained from:

For further information on this or other buildings-related projects, please contact: Enquiries Bureau, Building Research Energy Conservation Support Unit (BRECSU), Building Research Establishment, Garston, Watford, WD2 7JR. Tel No. 0923 664258. Fax No. 0923 664097.

For further information on industrial projects, please contact the Energy Efficiency Enquiries Bureau, Energy Technology Support Unit (ETSU), Building 156, Harwell Laboratory, Oxon OX11 0RA. Tel No: 0235 436747. Telex No: 83135. Fax No: 0235 432923.

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